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# Internal vs. External IT Capabilities: When to Hire IT Consultants?

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## ABSTRACT

External IT consultants are specialists who bring in skills that may be lacking within a firm. However, a lack of firm specific knowledge, low legitimacy, and a host of other factors may limit the effectiveness of IT consultants. From a resource-based perspective, consultants can represent a rich source of short term, valuable capabilities. These capabilities, however, may be at odds with exiting internal capabilities. Institutional theory suggests that external consultants may not share the same norms and beliefs held by the internal staff and consequently their efforts will be ineffective in achieving organizational goals. The paper explores this tension using survey data to track the benefits accruing from the use of internal and external IT capabilities in the adoption of Internet business solutions. The results show that firms see tangible benefits from using external IT consultants but that these benefits are moderated by the level of existing internal IT capabilities.

## Keywords

IT consultants, IT capabilities, data envelopment analysis, resource-based view, institutional theory.

## INTRODUCTION

While large offshore IT outsourcing projects have dominated the headlines recently, outsourcing on a much smaller scale, through the use of external IT consultants, has been going on for decades. The effectiveness of using external IT consultants, however, varies greatly. When a firm's internal IT capabilities are nonexistent or inadequate, external IT capabilities (in the form of consultants) can become very effective tools to pursue organizational goals (Massey and Walker, 1999; Patton, 2005; Thong, Yap and Raman, 1996). However, in some cases, external IT capabilities add no value beyond what can be provided by internal IT capabilities. It is also conceivable that conflicts may arise between internal and external IT capabilities that serve to diminish the overall productivity of organizational information technology. This research examines the relationship between internal IT capabilities, external IT capabilities, IT productivity, and firm performance.

This research uses data drawn from the Net Impact Study (Varian, Litan, Elder and Shutter, 2002). The purpose of the Net Impact Study was to collect data on past and expected impacts of Internet business solutions (IBS) at the firm level. Since IBS often span departments within the organization or even across organization boundaries, the Net Impact Study presents an opportunity to test our hypotheses on some of the most complex and sophisticated forms of organizational IT.

It is easy to find success stories involving the use of IT consultants. Successful IT projects are celebrated and are widely reported because they are beneficial for consultants and clients alike. It is less straightforward to find reports of failed IT projects involving the use of external IT consultants because of fear of loss of reputation and due to legal constraints. However, the lack of evidence of failure should not be interpreted as an indication that using IT consultants is unproblematic. Rather, surveys reveal a great dissatisfaction with IT consultants (c.f. James, 1998). This study is motivated by the mix of positive and negative experiences and is conducted with the goal of providing an explanation for the contradictory evidence.

The impact of external IT capabilities, in the form of consultants, on IT productivity and firm performance is important for a number of reasons. The first reason is ubiquity. Practically all firms use external IT capabilities at some point in their lifecycles. In many cases, external IT capabilities form a larger component of overall spending than internal IT capabilities – a trend that may be increasing. A second reason is financial. Anecdotal evidence suggests that projects involving IT consultants often run over time and over budget, and at times conflicts arise between the consultants and the internal IT staff resulting in sub-optimal performance. A third reason is learning and growth. Firms must balance the need for immediate help

gained from outside resources, against the longer-term development of internal capabilities. A question faced by many firms is when to look externally for help and when to rely on internal capabilities. In this paper, we explore salient factors that can help managers assess the potential contribution of external IT capabilities to organizational performance.

The outline of the paper is as follows. The literature review, the underlying theories and hypotheses are presented in the following section. The data, methodology, and results are then presented. The paper concludes with a discussion of the results, limitations of the study, suggestions for future studies, and conclusions.

## LITERATURE REVIEW AND HYPOTHESES

The extent to which firms should utilize external IT resources rather than rely on internal capabilities is as relevant to theory as it is to practice. This paper draws on four theoretical perspectives to derive conflicting hypotheses regarding the balance that firms should strike between internal and external IT capabilities. The four theories are the resource-based view of the firm (RBV), microeconomic theory (MET), institutional theory (INT), and social identification theory (SIT).

The first hypothesis relates solely to internal capabilities. The RBV suggests that firms can achieve positive organizational outcomes to the extent that they possess rare, valuable, and appropriable capabilities (Barney, 1991). Further, those gains can be sustained if firm's capabilities resist imitation and substitution (Wade and Hulland, 2004). Individual components of IT infrastructure may be valuable, but they are unlikely to be rare. By contrast, internal IT capabilities, in the form of IT staff, accumulated firm-specific knowledge, organizational IT linkages among internal departments, external IT linkages between the firm and external partners, and so on, are likely to be both valuable and rare. Due to the inherent complexity of these elements, internal IT capabilities may be hard to imitate or substitute, at least over the short term. In summary, everything else being equal, we expect to find a positive association between strong internal IT capabilities and IT productivity. Thus,

Hypothesis 1 (H1): The productivity of IT will be positively associated with higher levels of internal IT capabilities.

Support for H1 should motivate a firm that is lacking in its internal IT capability to search for alternative sources of relevant knowledge and expertise. As noted above, the RBV regards the firm as a collection of resources and capabilities, that if used correctly, can lead a firm to a position of sustained competitive advantage. If a firm lacks a particular capability, then it must seek to develop it internally, or acquire it from factor markets. Thus, one approach for a firm with an IT capability shortfall is to reach out to the external marketplace to acquire that capability (Barney, 1991). By this logic, internal IT capabilities and external IT capabilities are strategic substitutes. From the perspective of Microeconomic theory (MET), IT staff and IT infrastructure are complements. If the IT staff does not have the necessary skills required to manage the IT infrastructure, then the organization can hire external IT capabilities to help properly manage it. To the extent that internal IT capabilities are weak, external IT capabilities can increase the productivity of IT and produce positive organizational outcomes (Thong et al., 1996; Varian, 1992). Thus,

Hypothesis 2 (H2): Given weak internal IT capabilities, the productivity of IT in firms that utilize external IT capabilities will be higher than in those firms that do not utilize external IT capabilities.

In cases where internal IT capabilities are strong, the effect of external IT capabilities on IT productivity and firm performance is unclear, resulting in conflicting hypotheses. To the extent that internal and external IT capabilities are equally strong, microeconomic theory argues that these two factors of production are substitutes, and would thus provide no net benefit. The literature on absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002) suggests that the usefulness of external know-how depends on the ability of the organization to put it to use. If external know-how provided by external IT consultants adds little to internal knowledge, then it may be of little use. In other words, if the organization hires external IT consultants when its IT staff possesses relevant knowledge and expertise, it will not realize additional benefits because the two groups provide similar and redundant functionality. Thus,

Hypothesis 3a (H3a): Given strong internal IT capabilities, the productivity of IT will be unaffected in a firm that utilizes external IT capabilities.

It is conceivable, however, that the combination of strong internal IT capabilities combined with external IT capabilities may produce a negative outcome. According to institutional theory, the effectiveness of organizational activities depends on the legitimacy assigned to them by relevant constituents. Activities that lack legitimacy may face active or passive resistance and are therefore less likely to achieve their intended goals. If a firm with strong internal IT capabilities (say an experienced IT staff) hires external capabilities (say a group of IT consultants), resentment and conflict may arise. The external IT capabilities may lack legitimacy and will not be effectively used by the firm. Thus, synergies with internal IT capabilities may not accrue as expected. In addition, social and group identification theory suggests that internal IT staff may perceive external IT consultants as a threat, or a signal that its own legitimacy is in jeopardy. Under such circumstances, the

collaboration between internal and external IT capabilities will not be effective in achieving the goals of the organization, i.e. improvements in organizational performance (Ashforth and Mael, 1989; Hussin, King and Cragg, 2002; Massey and Walker, 1999; Suchman, 1995). Thus,

Hypothesis 3b (H3b): Given strong internal IT capabilities, the productivity of IT in firms that utilize external IT capabilities will be lower than in those firms that do not use external IT capabilities.

## DATA

The data used in this study were taken from the Net Impact Study (Varian et. al., 2002). The purpose of that study was to collect data on past and expected impacts of Internet business solutions (IBS) at the firm level. Data on 2065 firms were collected during the summer of 2001 through a phone survey. For the purposes of the study, we selected a sample of one hundred and eleven firms for which complete information about all the inputs used and all the outputs produced in the process were available. The five input variables used in the analysis are 'communication and networking hardware purchases', 'communication services purchases', 'computing hardware purchases', 'total software purchases', and 'other personnel and consulting purchases'. The three outputs variables are 'revenues', 'costs of goods sold (COGS)', and 'sales, general and administrative costs (SG&A)'. The outputs are measured as a percentage change since the implementation of the IBS. Summary statistics are presented in Tables 1, 2 and 3.

	N	Mean	Median	Std. Dev.
# of IBS Implemented	111	5.82	6	2.30
Time-Since-First-Using-IBS	111	4.36	4	2.31
Annual IT Spending	111	118M	500K	663M
IT Market Value	111	67.9M	500K	341M
Increase in Revenue (%)	111	15.12	6	23.47
Decrease in COGS (%)	111	6.66	3	9.86
Decrease in SG&A	111	7.76	5	9.54

**Table 1. Summary Statistics**

# of employees	Frequency
<100	17
101-200	29
201-500	22
501-1,000	12
1,001-5,000	11
>5,000	20
Total	111

**Table 2. Number of Employees**

Title	Frequency
Executive/Owner	36
CIO/CTO	21
Manager/Supervisor/Dept. Head	37
IT Technical Staff	13
Other	4

Table 3. Title of Respondent

Hypothesis 1 maintains that firms can benefit from strong internal IT capabilities, while Hypothesis 2 argues in favor of using external IT capabilities as a way of dealing with nonexistent or deficient internal IT capabilities. The decision to use or not to use external IT capabilities was operationalized as a dummy variable with a value of one (1) being assigned to firms who decide in favor of using external IT consultants and a value of zero (0) to those who choose to rely on internal IT capabilities instead.

Hypotheses 3a and 3b relate the interaction between strong internal IT capabilities and external IT consultants. Two variables were used to operationalize internal IT capabilities. The years that have passed since the organization's first experience with IBS and the number of existing IBS were both included in the statistical analysis as proxies for internal IT capabilities. A higher number of existing IBS systems and time-passed-since-first-IBS-experience were proxies for higher levels of IBS-related knowledge and expertise – hence, stronger IT capabilities.

#### DATA ANALYSIS

The data analysis was conducted in two distinct stages. The first stage utilized data envelopment analysis (DEA), a nonparametric tool that is described in Appendix A. Because the firms represented different industries, a Variable Returns to Scale (VRS) model was chosen for the best-practice frontier. DEA was used to rank-order the productivity of the five IT inputs on the three output measures. The result of the DEA is a single score assigned to each firm, which measures the productivity of the IT inputs by determining the efficiency with which a given level of output is produced by varying levels of the inputs. A score of less than 1 is interpreted as an identification of inferior, or unproductive, factors of production.

Executing the DEA Solver<sup>1</sup> (Zhu, 2002) on the set of firms resulted in an envelope, or an efficient frontier, that comprised of 19 firms along with 92 inefficient firms. Technical efficiency (i.e., the *score*) was interpreted as a measure of IT productivity. A high score meant that a firm was efficient at transforming inputs into outputs. That is, its inputs were more productive. In particular, a firm with a high score was able to convert IT capabilities into higher revenues and/or lower costs relative to a low-score firm. Since inputs cost money, an inefficient firm is said to be wasting its scarce resources by allocating too much of them to IT while realizing benefits at a level that is possible to obtain with fewer resources.

The firms were then divided into three equally large groups based on their relative scores. Group one contained the lowest ranking 37 firms; group two contained the middle firms, while the third group contained the 37 best performers according to the results of the DEA analysis. The hypotheses were then tested using this data as input into logistic regression analysis.

The logistic model examined the probability of being classified as a best performer (high IT productivity) vs. a worst performer (low IT productivity). The middle group was excluded to make the differences between the two groups more obvious, thus assisting in the identification of the discriminating factors. Table 4 presents three measures of goodness of fit of the model to the data.

-2 LogLikelihood	Cox & Snell R Square	Nagelkerke R Square
88.951	.168	.224

Table 4. Goodness of Fit Measures

<sup>1</sup> A slack-analysis did not reveal any slacks in the model.

The results of the logistic regression analysis are presented in Table 5. The variables 'Number of IBS', 'IT Consultants' and the interaction between them are significant at the .05 level.

Variables in the Equation	B	S.E.	Wald	df.	Sig.	Exp(B)
<b># of IBS</b>	<b>.697</b>	<b>.329</b>	<b>4.497</b>	<b>1</b>	<b>.034</b>	<b>2.009</b>
Time-Since-First-Using-IBS	.323	.359	.813	1	.367	1.382
<b>IT Consultants</b>	<b>5.364</b>	<b>2.690</b>	<b>3.977</b>	<b>1</b>	<b>.046</b>	<b>213.569</b>
Time-Since-First-Using-IBS * IT Consultants	-.476	.382	1.552	1	.213	.622
<b># IBS * IT Consultants</b>	<b>-.770</b>	<b>.357</b>	<b>4.643</b>	<b>1</b>	<b>.031</b>	<b>.463</b>
# of Employees	-.244	.146	2.797	1	.094	.784
Constant	-3.704	2.454	2.278	1	.131	.025

**Table 5. Logistic Regression**

We operationalized internal IT capabilities as the number of IBS systems already implemented and the number of years that have passed since the organization first adopted an IBS. As expected, a larger number of IBS systems is positively associated with higher IT productivity. Clearly, having prior experience with IBS integration helps a firm integrate new IBS more effectively. The other variable approximating IT capabilities – i.e., time-passed-since-first-IBS-experience – was not significant (although its coefficient was positive as expected). Thus, hypothesis 1 was only partially supported by the data.

The direct effect of IT consultants is positive. This is in accordance with hypothesis 2 that postulated a positive relationship between external IT capabilities and high IT productivity.

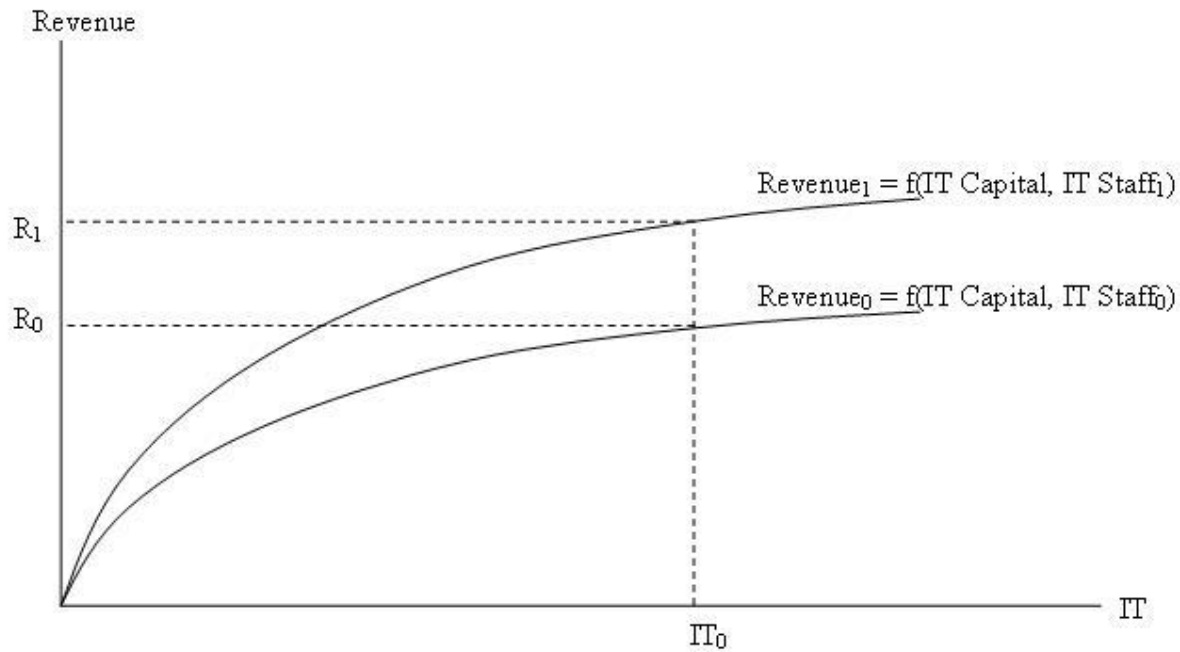
Finally, the interaction effect between external IT capabilities and internal IT capabilities was significant. Hypothesis 3a proposed that external IT consultants would have no effect on IT productivity and firm performance in the presence of strong internal IT capabilities. The data did not support this hypothesis. By contrast, Hypothesis 3b suggested that there would be a decline in IT productivity when external IT consultants were confronted with strong internal IT capabilities. This hypothesis was supported by the data.

## DISCUSSION

The results of this study support resource-based and microeconomic arguments that firms can gain competitive advantage through the use of superior firm capabilities. From an economics perspective, higher IT productivity is achieved when the same level of IT produces more output and generates more revenue to the firm. Complementarities between IT infrastructure and IT personnel lead to enhanced productivity. This notion is illustrated graphically in Figure 1. The IT used to produce output is identical for both firms – i.e.,  $IT_0$  – but firm 1 is using superior IT capabilities to make use of its IT infrastructure. Consequently, firm 1 realizes higher IT productivity levels.

Our findings support the contention that external IT capabilities increase IT productivity (H2). Clearly, in the case where internal IT capabilities are weak, a firm can benefit from the experience and expertise of external IT consultants. This finding is in line with the microeconomic perspective that predicts such an outcome for complementary inputs. This outcome also supports the RBV that suggests that valuable and possibly rare (albeit not inimitable) resources can provide a competitive advantage over the short-term. This finding could be interpreted as evidence that firms should not look at the strategic value of the individual resource, but rather determine its value as a component in an interdependent relationship with other organizational resource. Such relationships may produce complementarities conducive to achieving a sustainable competitive advantage. If this interpretation is true, then even an imitable and common resource, such as IT consultants, may become strategic when combined with other organizational resources with which it is synergistic.

The findings for firms with strong internal IT capabilities were more complex. Microeconomic theory would treat strong internal IT capabilities and external IT capabilities in the form of consultants as substitutes. According to this view, using external IT consultants when internal IT capabilities are strong would add no net benefit to the firm as the two groups provide redundant functionality. The results did not support the hypothesis (H3a) that given strong internal IT capabilities, external IT capabilities would have no effect on IT productivity and firm performance.



**Figure 1. The Effect of IT Staff Experience on IT Productivity**

Social and group identity theory suggests that external IT consultants may not receive the legitimacy they require if they are perceived as a threat to the incumbent IT staff, or if their knowledge and expertise do not differ from that possessed by the in-house IT team. Under these circumstances, external IT consultants' impact on IT productivity and firm performance is expected to be lower. The data showed that if a firm decided to hire external IT capabilities when they already had sufficient expertise internally, the outcome would be sub-optimal (H3b). This result is in line with institutional and group identification theories, which introduce legitimacy as an important component of effective activity accomplishment.

When these relationships are plotted on a graph (see Figure 2), it is possible to observe an interesting outcome. When the firm has a small number of IBS systems, that is, when its internal IT capabilities are low, hiring IT consultants will have a net positive effect on IT productivity (measured as the vertical distance between the dashed line and the upward sloping line to the left of  $X_0$ ). However, if the firm has already integrated many similar systems and has developed adequate knowledge, the firm would be better off not hiring IT consultants and instead rely on its internal IT capabilities. The net (negative) effect of resorting to external expertise rather than relying on internal capabilities is measured as the vertical distance between the dashed line and the upward sloping line (to the right of  $X_0$ ). For high levels of internal IT capabilities, the net effect on IT productivity following the decision to hire external IT consultants is negative.

The data suggests that the optimal decision strategy is to hire external IT consultants when internal IT capabilities are low and to rely solely on the knowledge and expertise of the internal IT staff when these are high. From Figure 2 it is clear that to the left of  $X_0$  the decision should be to rely on external as well as internal IT capabilities, while to the right of  $X_0$  the firm should rely solely on its internal IT staff.  $X_0$  – the level of internal IT capabilities above which the firm should not hire IT consultants is expected to vary from firm to firm. This cut-off level is a function of the firm's IT capabilities, its ability to legitimize the consultant team, and to foster healthy collaboration between the external and internal IT groups. Firms are advised to evaluate their internal IT knowledge before hiring external IT consultants. Failure to do so may in fact hurt the firm instead of helping it.

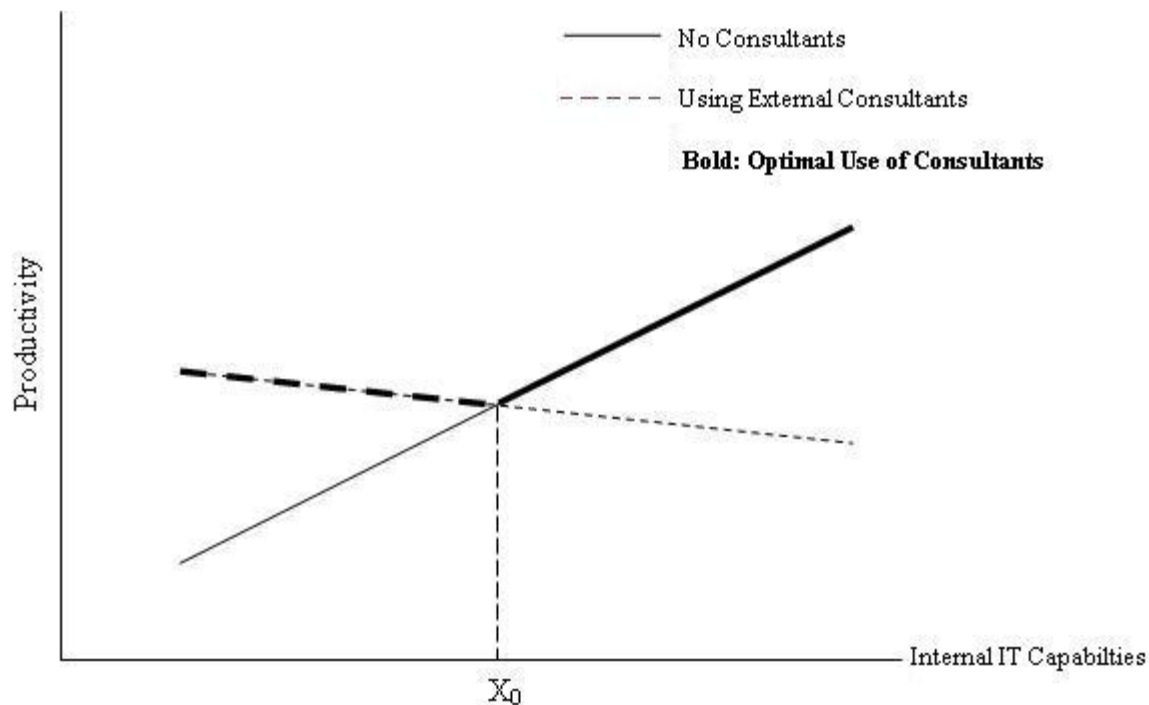


Figure 2. Optimal Use of Internal and External IT Expertise

### IMPLICATIONS FOR MANAGERS

In this paper, we identify an important factor that can help managers assess the potential contribution of external IT capabilities to organizational performance. Managers should assess their internal IT capabilities before considering using external IT consultants. If the internal IT capabilities are strong, there may not be a need to bring in additional IT personnel. Instead, the firm would be better off spending its limited resources on a continued upgrade of its internal IT staff capabilities. External IT consultants should only be hired when it is clear that without them the IT project would not be completed on time and within budget and when the internal IT staff has much to learn from the consultants. If this is not the case, that is, if the in-house IT team can finish the project on its own and has similar knowledge and expertise to those possessed by the external consultants, the effectiveness of the consultants will diminish and may even result in negative outcomes for the firm. Based on the results, we found that the cutoff point beyond which firms are better off relying solely on internal IT capabilities ( $X_0$ ) is about four IBS systems. Apparently, the experience gained from implementing four IBS solutions in the past provides organizations with a strong enough IT capability that renders the external know-how unnecessary.

### LIMITATIONS AND FUTURE RESEARCH

We operationalized IT capabilities through the number of IBS implemented along with the time since the first IBS was implemented. While these measures seem adequate, they were not subjected to tests of content validity or to factor analysis. If this study were to be replicated in the future, researchers are advised to develop a construct for internal IT capabilities with demonstrated validity and reliability. Because we used secondary data, we could not talk to the respondents and verify that lack of legitimacy and group identity issues were responsible to the relative ineffectiveness of the IT consultants in contributing to organizational performance. Future studies should attempt to measure these constructs explicitly and if possible supplement them with interviews that may shed more light on the nature of the conflicts and their antecedents. Finally, this research suggests that commodity-like resources, such as IT consultants, can become sources of competitive advantage if they strategically complement other organizational resources. Future studies should investigate this interesting proposition.



## CONCLUSIONS

This study found broad support for both the resource-based view and institutional theory, but failed to support micro-economic theory. This research has demonstrated that external IT capabilities, in the form of consultants, can provide skills and expertise that are not in the possession of a firm, thus enabling it to achieve superior performance. If, however, a firm already possesses proficient internal IT capabilities, the benefits of external capabilities may not be realized. Based on our findings, even moderate internal experience with IT is sufficient to render external IT consultants' knowledge redundant. Further, the internal IT staff may perceive the external IT consultants as a threat, resulting in conflict and ultimately lower IT productivity and firm performance. Firms should evaluate their internal IT capabilities before making a decision to hire external IT capabilities. If the in-house IT staff is capable of developing and integrating the IT on its own and if the potential for a conflict is high, this study suggests that the firm is better off relying solely on internal IT capabilities.

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## APPENDIX A - A BRIEF DESCRIPTION OF DATA ENVELOPMENT ANALYSIS

Data envelopment analysis (DEA) is a mathematical programming model developed by Charnes, Cooper and Rhodes (1978), for evaluating the efficiencies of a set of  $n$  decision making units (DMUs), relative to one another. It is a non-parametric tool that does not pre-assume any functional form. The method has been used to assess input productivity in many different environments, including sets of bank branches, hospitals, schools, maintenance units, and so on. See for example, Cook, Hababou and Tuenter (2000), and Cook and Hababou (2001).

In the typical problem setting, each DMU <sub>$j$</sub>  is characterized by a vector of outputs  $Y_j = (y_{rj})$ , and a vector of inputs  $X_j = (x_{ij})$ . One measure of efficiency  $e_o$  of any DMU "o" is given by the solution to a particular nonlinear, non-convex fractional programming problem. Specifically, the VRS model of Banker, Charnes and Cooper (1984) is given as the solution to the set of fractional programming problems:

$$\begin{aligned} & \max \frac{uY_o + \omega}{vX_o} \\ & \text{subject to:} \\ & \frac{uY_j + \omega}{vX_j} \leq 1, \quad j = 1, \dots, n \\ & u, v \geq 0, \quad \omega \text{ unrestricted} \end{aligned} \quad (1)$$

In practical terms, this model is optimizing a linear affine function of aggregate outputs to aggregate inputs. Simplistically, this is a form of benefit cost ratio. The restrictions or constraints on the model require that any multipliers used must be such that this ratio does not exceed 100% for any of the DMUs.

To facilitate solving this nonlinear form, Charnes et al. (1978) have shown that (1) can be represented by the more tractable linear programming equivalent:

$$\begin{aligned} & \max \mu Y_o + \omega \\ & \text{subject to:} \\ & vX_o = 1 \\ & \mu Y_j + \omega - vX_j \leq 0, \quad j = 1, \dots, n \\ & \mu, v \geq 0, \quad \omega \text{ unrestricted} \end{aligned} \quad (2)$$

and its dual formulation

$$\begin{aligned} & \min \theta \\ & \text{subject to:} \\ & \theta X_o - \sum_{j=1}^n \lambda_j X_j \geq 0 \\ & \sum_{j=1}^n \lambda_j Y_j \leq Y_o \\ & \sum_{j=1}^n \lambda_j = 1 \\ & \lambda_j \geq 0, \quad j = 1, \dots, n \end{aligned} \quad (3)$$

The goal of the DEA analysis is to compare the different units on the basis of their ability to transform inputs into outputs. The basis for this comparison is the *score* given by the objective function value of (2) (or (3)). One can view the DEA analysis as being conducted by holding outputs at a constant level while minimizing inputs, or as holding inputs constant while maximizing outputs. In the current study we employed the former.

One outcome of the DEA analysis is a rank ordering of the DMUs from the data set, based on their relative efficiencies in converting inputs to outputs. The scores obtained provide an understanding as to which firms are more productive than others, without having to prescribe a predetermined parametric relationship between the input and the output variables.

DEA has been used to investigate productivity-related questions in the IT field only recently (i.e. Banker and Slaughter, 1997; Herrero and Salmeron, 2005; Lee and Menon, 2000; Seiford and Zhu, 1999; Shao and Lin, 2002).